

CLAIMS

What is claimed is:

1. A light emitting diode device, comprising:
 - a substrate deposited on a bottom of the light emitting diode device;
 - 5 a semiconductor layer formed above the substrate and including an n-type semiconductor, an active layer and a p-type semiconductor layers, wherein the active layer is formed between the n-type semiconductor layer and the p-type semiconductor layer; and
 - a patterned transparent conductive layer is formed on the p-type semiconductor layers filled with a light-transmission conductive layers so as to
10 increase transmission effectively of the light emitting diode device.
2. The light emitting diode device of claim 1, wherein the substrate is a sapphire substrate.
3. The light emitting diode device of claim 1, wherein the n-type semiconductor is
15 an N-GaN layer.
4. The light emitting diode device of claim 1, wherein the p-type semiconductor layer is a P-GaN layer.
5. The light emitting diode device of claims 1, wherein the active layer is an InGaN/GaN multiple quantum well structure .
- 20 6. The light emitting diode device of claims 1, wherein the light-transmission conductive layer is a metal-oxide layer.

7. The light emitting diode device of claim 1, wherein the patterned transparent conductive layer is made at least one of metals selected from the group consisting of Ni, Au, Cr, Ir, Pt, Ag, Ru and Be.

8. The light emitting diode device of claims 1, wherein the light-transmission conductive layer with high transparency is an oxide layer selected from the group consisting of indium tin oxide (ITO), indium oxide, tin oxide, indium lead oxide, lead oxide, antimony tin oxide, antimony oxide, antimony zinc oxide, cadmium tin oxide, cadmium oxide, zinc oxide, and magnesium oxide.

9. A light emitting diode manufacturing method, comprising the steps of:

10 forming a substrate on a bottom of the light emitting diode device;
forming a semiconductor layer above the substrate and including an n-type semiconductor, an active layer and a p-type semiconductor layers, wherein the active layer is formed between the n-type semiconductor layer and p-type semiconductor layer;

15 forming a patterned transparent conductive layer formed on the p-type semiconductor layers ; and

forming a light-transmission conductive layer formed overlay the patterned transparent conductive layer; wherein an occupied area of the patterned transparent conductive layer following a formula

20
$$a < (1 - T_T / T_I) A$$

where a is the patterned transparent conductive layer occupied area,

A is the area of light emitting diode,

T_T is the transparency of patterned transparent conductive layer,
and

T_L is the transparency of light-transmission conductive layer.

5 10. A light emitting diode device, comprising:

a substrate deposited on a bottom of the light emitting diode device;

a semiconductor layer formed above the substrate and including an n-type semiconductor, an active layer and a p-type semiconductor layers, wherein the active layer is formed between the n-type semiconductor layer and the p-type semiconductor layer;

10 a patterned reflection layer formed on the p-type semiconductor layers ;

a patterned transparent conductive layer formed on the patterned reflection layer; and

a light-transmission conductive layer formed overlay a hybrid of the patterned transparent conductive layer and the patterned reflection layer; wherein the patterned reflection layer reflects light absorbed by the patterned transparent conductive layer so as to increase illumination of the light emitting diode device.

20